

Runtime randomization and perturbation for virtual machines.

JAVIER CABRERA ARTEAGA

Licentiate Thesis in [Research Subject - as it is in your ISP]
School of Information and Communication Technology
KTH Royal Institute of Technology
Stockholm, Sweden [2022]

TRITA-ICT XXXX:XX ISBN XXX-XXX-XXXX-X KTH School of Information and Communication Technology SE-164 40 Kista SWEDEN

Akademisk avhandling som med tillstånd av Kungl Tekniska högskolan framlägges till offentlig granskning för avläggande av licentiatexamen i [ämne/subject] [veckodag/weekday] den [dag/day] [månad/month] [år/2022] klockan [tid/time] i [sal/hall], Electrum, Kungl Tekniska högskolan, Kistagången 16, Kista.

© Javier Cabrera Arteaga, [month] [2022]

Tryck: Universitetsservice US AB

Abstract

Write your abstract here... $\textbf{Keywords:} \ \, \textbf{Keyword1}, \, \textbf{keyword2}, \, \dots$

Sammanfattning

Write your Swedish summary (popular description) here... $\bf Keywords : Keyword1, \, keyword2, \, ...$

Acknowledgements

Write your professional acknowledgements here...

Acknowledgements are used to thank all persons who have helped in carrying out the research and to the research organizations/institutions and/or companies for funding the research.

Name Surname, Place, Date

Personalizado iconos creados por monkik - Flaticon

 $<\!a\,href="https://www.flaticon.es/iconos-gratis/computadora"\,title="computadora iconos">Computadora iconos creados por Freepik - Flaticon>$

Contents

Co	onter	nts	vi
1	Intr 1.1 1.2 1.3	Research questions	1 2 2 3
2	Bac 2.1 2.2 2.3	kground & State of the art WebAssembly overview	7 7 12 17
3	Tecl 3.1 3.2 3.3	hnical contributions Artificial Software Diversity for WebAssembly CROW: Code Randomization Of WebAssembly MEWE: Multi-variant Execution for WEbAssembly	21 21 23 28
4	Met 4.1 4.2 4.3	thodology RQ_1 . To what extent can we artifically generate program variants for WebAssembly?	35 38 40
5	Res 5.1 5.2 5.3	ults RQ_1 . To what extent can we artifically generate program variants for WebAssembly?	43 46 49
6		nclusion and Future Work Summary of the results	53

CONTENTS	vii					
6.2 Future work						
Bibliography						
Index	63					